

## Compact Sensor for Isotope and Trace Gas Analysis, Phase II

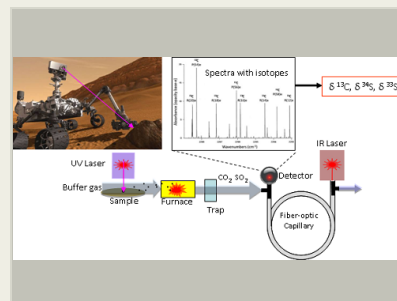
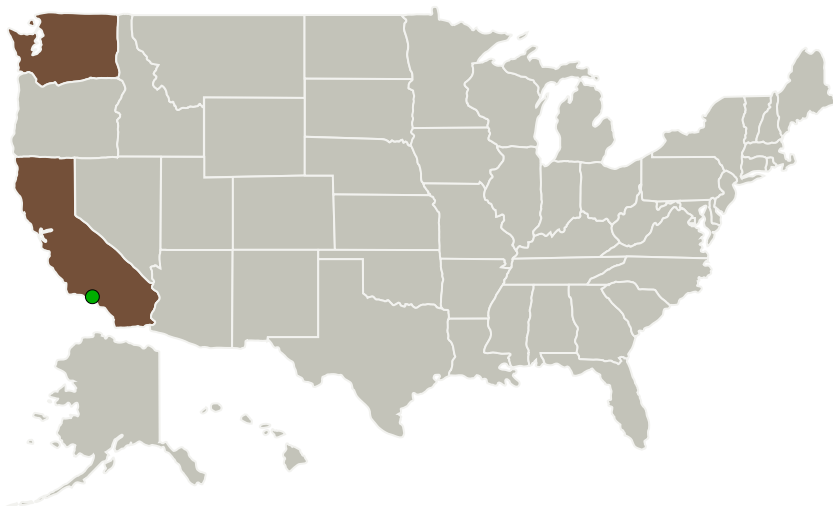
Completed Technology Project (2015 - 2019)



## Project Introduction

We propose to develop and demonstrate a new sensor platform for isotope and trace-gas analysis that is appropriate for future planetary missions. Among other applications, the technology can enable the collection of isotope ratio data in support of the search for evidence of life within the solar system. Current limitations to in-situ isotope measurements will be overcome by utilizing a capillary absorption spectrometer (CAS). This concept enables high precision measurements within the ultra-small volume ( $\sim 0.1$  ml) of a hollow fiber optic capillary and has proven to be three orders of magnitude more sensitive than competing sensors. The proposed effort focuses on transitioning the current lab-based technique to a small size, weight, and power (SWaP) device that can be operated unattended. In Phase I, proposed concepts for improving the system performance, reducing the SWaP, and engineering a field-capable device were proven and specific options down selected. Under Phase II, we will fully develop a general prototype sensor platform, which is applicable to a wide range of isotope ratio and trace-gas analysis applications. Specific examples of the utility and versatility of the concept will be demonstrated by using the system as a stand-alone gas sensor, as well as in combination with both a laser ablation sampler and a gas chromatograph. In addition, a dual laser system will be developed to measure both Carbon (C) and Sulfur (S) isotope ratios. The sensitivity afforded by the proposed system would open up remote analysis of smaller samples than ever before measured, which could be a significant development in the search for biosignatures on other planets and near space objects, as well as in the early Earth rock record.

## Primary U.S. Work Locations and Key Partners



Compact Sensor for Isotope and Trace Gas Analysis, Phase II Briefing Chart Image

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## Compact Sensor for Isotope and Trace Gas Analysis, Phase II

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Organizations Performing Work	Role	Type	Location
Opto-Knowledge Systems, Inc.(OKSI)	Lead Organization	Industry	Torrance, California
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California
Pacific Northwest National Laboratory(PNNL)	Supporting Organization	R&D Center	Richland, Washington

## Primary U.S. Work Locations

California

Washington

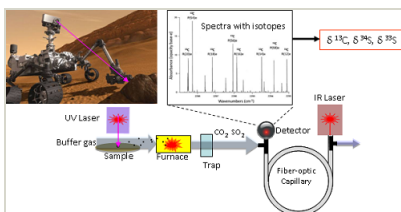
## Project Transitions

**May 2015:** Project Start**February 2019:** Closed out

## Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138050>)

## Images



## Briefing Chart Image

Compact Sensor for Isotope and Trace Gas Analysis, Phase II

Briefing Chart Image

(<https://techport.nasa.gov/image/129247>)

## Organizational Responsibility

## Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

## Lead Organization:

Opto-Knowledge Systems, Inc. (OKSI)

## Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

## Program Director:

Jason L Kessler

## Program Manager:

Carlos Torrez

## Principal Investigator:

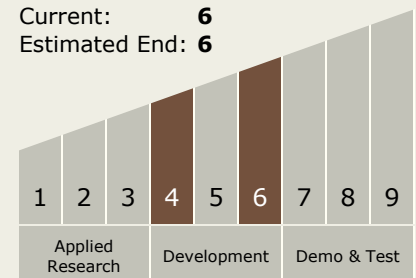
Jason M Kriesel

## Technology Maturity (TRL)

Start: 4

Current: 6

Estimated End: 6



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### Technology Areas

#### Primary:

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
    - └ TX08.1.3 Optical Components

### Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System